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- (71) Applicant: Fisher & Paykel Healthcare Limited East Tamaki, Auckland (NZ)

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a gas conduit

Connector for the pneumatical and electrical coupling between a gases supply means and

### (72) Inventors:

- Pakuranga, Auckland (NZ) Deshita, Airawana Edirisuriya
- Poh Ming Laurent, Kristopher
- **Bucklands Beach, Auckland (NZ)**
- Representative: 80336 München (DE) Pettenkoferstrasse 20-22 Forrester & Boehmen Hoarton, Lloyd Douglas Charles et al

a patient to the humidifier. In particular, the invention is devices and heated breathing conduits used to couple tions between respiratory humidifiers and/or other such The present invention relates to the connecbe of a single port type or a dual port type. The dual port as a humidifier, blower or the like. The connector may throughout or about it and a gases supply device, such

to the patient and carries humidified gases to the patient and an inspiratory limb that extends from the humidifie ventitator or blower that carries dry gas to a humidifier have a dry line (dry breathing conduit) extending from a type connector is suitable for ventilator apparatus that

a conduit including an electrical wire extending within, trical and pneumatic, that is, scaled connection between a connector to couple a gases supply means and a con-

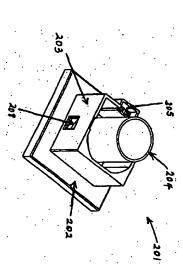


Figure 8

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### FIELD OF INVENTION

Description

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ed breathing conduits used to couple a patient to the present invention relates to the connections between rised oxygen and/or air to a patient. In particular, the though not sotely, to the delivery of humidified pressu-[0001] The present invention relates particularly, espiratory humidifiers and other such devices and heat-

## SUMMARY OF THE PRIOR ARI

chamber 103 also has an outlet 105. A connector 106 supplies gases to the humidifier. The humidification let 104 that is connected to the outlet of a device that et al.). A connector that simply fits into the humidifier in US 5,537,996 (McPhee) and US 5,392,770 (Clawson occur. In order to overcome this disadvantage it is the gases have been humidified, and therefore laden tory humidifier/ventilator system. In such a case where first humidify those gases, for example using a respiraternal connector 109 that is connected via known elecin the breathing conduit 108 is heated by way of the exone end of the conduit 101. The end of the connector 101 and the outlet 105. The connector 106 is located at causes the connection between the breathing conduit ffier 102 has a humidification chamber 103 having in innection between the conduit and humidifier. The humidthe heater wire within the breathing conduit and the con-To provide Figure 1 illustrates how current is supplied to chamber outlet is currently known that provides for conamples of such a heated breathing conduit are disclosed midifier breathing conduits to avoid condensation. Exknown to associate a heater wire with respiratory huduit to the patient, condensation of that water vapour will with water, it is likely that during transport through a con-[0002] In order to supply gases to a patient or a person trical wiring to the humidifier base 110. 106 fits snugly into or about the outlet 105. The wire withnection between a humidifier and a breathing conduit needing such gases, it may sometimes be necessary to ij 23

conduit and the humidifier outlet does not provide an op-Furthermore, the connection between the breathing problems for the user and will be in the way when in use. advantage that there are external wires that may cause [0003] Existing connectors of this type have the dis-

## SUMMARY OF THE INVENTION

overcoming the abovementioned disadvantages. vide a connector between a gases supply means and a heated breathing conduit that goes some way towards [0004] It is an object of the present invention to pro-

in a connector to couple a gases supply means and a [0005] In a first aspect the present invention consists

જ Figure 4 is an illustration of the humidifier base of

conduit, where said conduit includes electrical wire extending within, throughout or about said conduit, said

a male portion of a generally tubular shape connecting means, receiving means and an electrical connector receivduit, said male portion having a locking connector ed to one of said gases supply means and said con-

a female portion of a generally tubular shape connector means and an electrical connector means, conduit, said female portion having a locking connected to one of said gases supply means and said

to engage with said electrical connector receiving Condus quently between said gases supply means and said tion between said male and female portions and consemeans making a pneumatic seal and electrical connecsimultaneously causing said electrical connector means male and female portions together, and said coupling said locking connector receiving means and lock said causes said locking connector means to engage with wherein coupling of said male and female portions

disclosures and the descriptions herein are purely illusof the invention as defined in the appended claims. The [0006] To those skilled in the art to which the invention suggest themselves without departing from the scope ing embodiments and applications of the invention will trative and are not intended to be in any sense limiting. relates, many changes in construction and widely differ-

## BRIEF DESCRIPTION OF THE DRAWINGS

[0007] One preferred form of the present invention will drawings in which; now be described with reference to the accompanying

provide the connection between a breathing conduit Figure 1 is a connector used in prior art devices to

tion of conduit overheating system of the present midification system that may incorporate the detec-Figure 2 is a schematic diagram of a respiratory hu-

system that utilises the connector of the present in-Figure 3 is an illustration of a respiratory humidifier

system as connected to the connector of and humidifier are contained within an enclosure, present invention, wherein the gases supply means the respiratory humidifier system of Figure 2, and Figure 6 is a front view of the apparatus of Figure 5, used in conjunction with the connector of the Figure 5 is a perspective view of apparatus that is "Igure 7 is a side view of the heated gas delivery

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Figure 8 is a perspective view of the male portion of a first form connector of the present invention,

Figure 9 is a plan view of the male portion of the where the connector has a single port, connector of Figure 8,

Figure 10 is a side cross-sectional view of the male

tion of the first form of the connector of the present Figure 11 is a perspective view of the female porportion of the connector of Figure 7,

Figure 12 is a plan view of the female portion of the Figure 13 is a cross-sectional view of the female connector as shown in Figure 9,

portion of the connector shown through A-A in Fig-

male portion of the second form of the connector as Figure 14 is a perspective view of the male portion of a second form of the connector of the present Figure 15 is a partial cross-section side view of the invention, where the connector has a dual port, shown in Figure 12,

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Figure 16 is a perspective view of the female portion of the second form of the connector of the present invention,

Figure 17 is a cross-section of the female portion as shown in Figure 15,

Figure 18 is a perspective view of the male as moulded to one end to a conduit according to a por-

8 Figure 19 is a perspective view of the male portion Figure 20 is a perspective view of the female portion of the connector according to a third form of the of Figure 18 when not moulded to the conduit, tion as third form of the present invention,

35 Figure 21 is a underneath view of the male portion of the cannector of the third form of the present inpresent invention,

Figure 22 is a cross-sectional side view of the male

portion of Figure 18,

Figure 23 is an alternative side cross-sectional view of the male portion of Figure 19,

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Figure 24 is a undemeath view of the female portion of Figure 20,

Figure 25 is a side view of the female portion of

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Figure 26 is a plan view of the female portion of Figure 20,

8 cartridge type and the connector to the breathing Figure 27 is an illustration of a humidifier or CPAP device where the chamber for this device is of the tube is two part, the first pneumatic part located on Figure 20, and

the chamber and the second electrical part is locat-

breathing tube end connector extends over and Figure 28 is an illustration of the device of Figure when connected to the breathing tube when the Figure 29 is a first perspective view of a sliding covabout the two part connector of Figure 27, ed on the base, and

er of a connector according to fourth form of the

Figure 30 is a second perspective view of the sliding cover of Figure 29,

Figure 31 is a first perspective view of the female portion according to the fourth form of the connector of the present invention,

Figure 32 is a second perspective view of the female portion of Figure 31,

Figure 33 is a perspectyve view of the male portion according to the fourth form of the connector of the present invention.

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conduit attached to the female portion of the fourth form of the connector of the present invention, where the sliding cover is only partially covering the Figure 34 is a perspective view of the breathing

cover in a position that enables locking of the female Figure 35 is a cross-sectional view of the breathing conduit, female portion and sliding cover where the female portion

Figure 36 is a perspective view of the breathing conduit, female portion and sliding cover as shown portion to the male portion, and in Figure 25.

# DETAILED DESCRIPTION OF THE PREFERRED

devices, integrated CPAP and humidifier devices, or any the word humidifier alone must not be seen as restrictive corporating preferred embodiments of the connector of low, reference has been made to the connection of a breathing conduit to a humidifier, it must be appreciated that the connector of the present invention may be used to connect a breathing conduit to other medical devices, such as a positive pressure ventilation devices, continuous positive airway pressure (CPAP) devices, insufflation devices, integrated insufflation and humidification other such breathing assistance device that can be used in either home-care or hospital applications. The use of to the application or use of the connector of the present and in particular to Figure 2, an example of humidificathe present invention is illustrated. In the description betion apparatus and respiratory humidification system in-[0008] With reference to the accompanying drawings invention

having a metal base 7 sealed thereto. Humidification chamber 4 is adapted to hold a volume of water 8, which 2 that supplies gases (for example oxygen, anaesthetic gases or air) to the inlet 3 of a humidification chamber means 4 via a conduit 6. Humidification chamber means 4 may, for example, comprise a plastics formed chamber is heated by a heater plate means 9 under the control of controller or control means 11 of a humidificacion de-[0009] Included in the example respiratory humidification system as shown in Figure 2, is a gases supply means 1, such as a ventilator or blower, having an outlet vice or humidifier 10.

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Integrated Gases Supply Means and Humidifier

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es provided to the patient 13 a heating wire means 15 lion chamber 4 via outlet 12 and are passed to a patient chamber by way of a connector that will be described As the water within chamber 4 is heated it will is provided which is energised under the control of cones transportation pathway or inspiratory conduit 14. The slowly evaporate, mixing water vapour with the gases flow through the humidification chamber from ventilator Accordingly, humidified gases leave the humidificaor other person in need of such gases 13 through a gasconduit 14 is connected to the outlet of the humidifier below. In order to reduce condensation within the inspiratory conduit 14 and to raise the temperature of the gas-

\$ 8 33 52 8 duit heater element ensures the gases delivered are at to the ambient temperature, (being the temperature of than the temperature of the humidified gases within the conduit. The heater element effectively replaces the envection during transit through the conduit. Thus the con-[0012] A heating element 30 is provided within the the surrounding atmosphere) which is usually lower ergy lost from the gases through conduction and conheater plate 27 has a temperature transducer 28 that is cuitry in body 29 of the apparatus so that the control conduit 25 to help prevent condensation of the humidified gases within the conduit. Such condensation is due to the temperature of the walls of the conduit being close 25, which conveys humidified gases to the patient at the mask or facemask connected to the user's face, so as to supply humidified gases to the user. The humidifier in electrical connection with the electronic control cir-20 has a humidifying chamber 21 having edges, which engage with collar 22 on the humidifier 20. The gases to be humidified may be a mixture of air, oxygen and anaesthetic for example, which are supplied to the chamber through gas inlet 23. This might be connected vided and the gases outlet 24 is connected to the conduit end 26 of the conduit. The end 26 of the conduit may have a cannula connected to the patient's nose, nasal Referring to Figures 3 and 4, which show the humidifier 10 of Figure 2 in more detail. The humidifier to a ventilator, source of pressurised oxygen, flow generator, or air compressor. A gases outlet 24 is also promeans monitors the temperature of the heating plate. an optimal temperature and humidity. [0011]

a heater plate 36, which is connected to electronics that heat the plate 36, and enables humidification of the gas within the chamber when the chamber has water placed housed within an enclosure 33. The enclosure 33 has a [0014] In an alternative application, the connector of the present invention may be used with a humidifier that shown in Figure 5. The gases supply means (such as a blower, ventilator or insufflator) and humidifier are recess 34 that provides an area for a humidifying chamber 35 to be located in. The chamber 35 is situated upon has been integrated with a gases supply means within it. 15

duit, which is shown in Figure 7. This takes warm, humid gas from the enclosure and delivers it to the patient, maintaining temperature and humidity of the gas. The wire 45 and end 46, for use to connect the breathing [0015] Referring now to Figure 6, the chamber 35 has an entry port 40 that is connected to the outlet of the gases supply means housed within the enclosure 33, and an exit port 41 that has connected to it the breathing External to the enclosure is the breathing conconduit 42 comprises a tube 43, connector 44, spiral conduit (see Figure 7) that carries the gas to the patient. conduit to the patient. [0016]

the electrical outlet of the humidifier (not shown) within et are described in more detail below. Within the tube 6078730 (Fisher & Paykel Limited) running inside part 44 suitable for connecting to the gas outlet of the humidifier and an electrical socket suitable for connecting to the enclosure 33. The connector 44 and electrical sock-43 is a spiral wound heater wire 45, such as that described in US Patent No.5640951 or US Patent No. of, or all of the length of the tube 43. The terminations of this heater wire are connected to the electrical socket [0017] The enclosure end of the tube has a connector of the connector 44.

# Single Port Electrical/Pneumatic Connector

tion attached to the heated breathing circuit so that in use when the male and female portions are coupled together, a pneumatic and an electrical coupling is achieved between the breathing circuit and humidifier [0018] The connector of the present invention in a first ing conduit having heating wire, such as a conduit as described above. The connector comprises a male portion attached to a humidifier chamber and a female poror other such device, such as a positive pressure venform is a single port connector, which provides the connection between a humidifying apparatus and a breath-55

conduit, which when coupled provides both a pneumatic

suitable for coupling the conduit to the humidifier. The connector comprises a male portion attached to the humidifier and a female portion attached to the breathing and electrical coupling between the humidifier chamber and breathing circuit. The effect of the electrical connection in this manner, is that the electrical wire running the length of the conduit is controllable from the humidifier humidifier to the conduit that could be accidentally re-

[0013] The end of the conduit 25 has a connector 31

[0019] The male portion of the first form of a connector in accordance with the present invention is shown in Figures 8 to 10. The male portion 201 of the connector is generally tubular in shape, having a base 202 that is attilation device or blower.

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without there being additional external wiring from the moved by a patient or user. The connector is described

in more detail below

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self is separately injection moulded, but in the male porchamber or base of the humidifier. The male portion ititself, but in other forms the base may be clipped, weldbe sealed by way of an O-ring or other appropriate chamber of the humidifier, but be freely removable and and the conduit could be separately attached to the provides the pneumatic seating between the humidifier ber. For example, in some cases the mechanism that tion may be moulded integrally with the humidifier chamed, moulded or otherwise appropriately attached to the the base 202 will be the body of the humidifying chamber humidifying apparatus. In some forms of this connector means to the humidifier. lached, in an appropriate manner, to the chamber of the

tion is the body 203 and further extending from the base 202 and within the body 203 is a tubular protrusion 204. As can be seen in Figure 10 the tubular protrusion 204 in order to allow gases to flow through the male portion cular recess 205 located in the base of the male portion, extends through the body section 202 and abuts the cir-Extending from the base 202 of the male por-8

an electrical socket 205 having conductors 206, 207. On the wall of the body there are two elongate apertures [0021] Located on the body 203 of the male portion is connection in the apertures on the male portion causing a pneumatfemale portions are coupled the protrusions reside with sions on the female portion, so that when the male and 208, 209 that serve to receive complimentary protru-

the breathing conduit to the patient. tached to the breathing conduit, and finally through into 204 then into the female portion of the connector atthrough the recess 205 into the tubular protrusion In use, gases flow from the humidifying cham-

may be inserted into the port 212 after moulding. port 212 during the moulding of the female portion, or pins or contact surfaces can be either moulded into the tion from the electrical port 212 to the heater wire. The faces by appropriate fastening means causes connecor fastening the heater wire to the pins or contact sursiding within or about the breathing conduit. Soldering connected to the heater wire (as already described) recontact surfaces located within it (not shown) that are is also tubular in shape. The electrical port has pins or wall. Extending within the sleeve 211 is a port 214 that and protrusions 213 located on either side of the outer comprises a sleeve 211 having an electrical port 212 ture or materials may be used. The female portion 210 tics material but other appropriate methods of manufac-210 is manufactured by injection moulding from a plasshown) in an appropriate manner. The female portion male portion 210 is a generally tubular member that is be described with reference to Figures 11 to 13. The fe-[0023] The female portion of the connector will now about or within the breathing conduit (not

210 are coupled the tubular protrusion 204 slides be

205. Thus the meeting of the male and female portion 208, 209 and the electrical port 212 fits into the socket neously the protrusions 213, 215 fit into the apertures tween the tubular port 214 and the sleeve 211. Simulta

nection to be made. achieves a simultaneous electrical and pneumatic con The protrusions 213, 215 and apertures 208

lease of the circuit from the humidifier. When a user the male portion from within the female portion. releasing them from the apertures 208, 209 and remove tion they need only push the protrusions 213, 215 inward wishes to remove the male portion from the female pormechanism that allows user-friendly and efficient re-209 also have the effect of providing a quick release

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instead of the taper and/or quick release mechanism de [0026] In further forms of the connector as described scribed above. type fitting could be used to create the pneumatic seal the two surfaces. Alternatively, a thread or a bayonet female or male portions and a gasket placed in between above, a taper may be provided on the inner walls of the

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portion after the portion has been moulded. Alternative [0027] moulded. be formed and threaded onto the conduit, and then overly, a separate sub assembly with the conductors could may be inserted into the electrical connector on the male sembled with the mate portion then over-moulded, or The conductors referred to above may be as-

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both an electrical connection and a pneumatic seal. visual confirmation of an active circuit, so as to indicate the male or female portion of the connector to allow for small indicator, such as an LED, is embedded in either [0028] In preferred forms of the present invention, a

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â ӄ electrical part of the connector. additional pins and/or contacts are supplied within the measuring sensors. When additional leads are supplied wire itself could be used to carry electrical signals from positions along the conduit. Furthermore, the heater measuring sensors placed at the end or at intermediate ditional electrical lead that can also carry signals from conduit could also be accompanied by at least one ad-[0029] The heater wire located within the breathing

દ ક å to 26. This connector is comprised of a generally tubular shaped male portion 400 and similarly shaped female [0030] gular shape and extends from the outer surface of the duit 403. The electrical port 406 is of generally rectanor recess when the female portion is moulded to the con-405 has a protrusion 406 that defines an electrical port compared to the body section 405. The body section and a threaded end 404 that is of a reduced diameter 401 is a thermoplastic insert that has a body section 405 the portion 401 into the conduit 403. The female portion pathway 402 through it, to allow gases to pass through it can be seen that the female portion 401 has a tubular female portion. Referring to Figures 18, 19, 22 and 23 portion 401, where the male portion is fittable within the cording to the present invention is shown in Figures 18 A second form of a "single port" connector ac-

of recesses 422 located on the outer surface edge of body section 405 elastomer over the conduit and insert ing forms an outer surface covering 406 of thermoplastic ket. After moulding the plastics material from the mouldplastic elastomer) to flow into the insert, forming a gasplastics material used for moulding (such as a thermothe insert 401 nearest the threaded end 404 allow the and insert 401 are then over moulded, where a number by threading the conduit about the end 404. The conduit The insert 401 is attached to the conduit 403

the protuberances 417, 418 are pushed inwards the upouter covering 407 by the top edges of the upper arms 411, 412. The pivoting member 408 acts such that when over moulded, protuberances 417, 418 are formed in the lower arms 413, 414 have small inwardly extending protrusions 415, 416 that engage with the male portion of of the arms 411, 412, forming an outwardly extending of the standard tubular shape of the body section that is 405 of the insert 401. The pivoting member is a portion is integrally formed in the polycarbonate body section arms 413, 414 and small protrusions 415, 416 to pivot per arms 411, 412 are moved inwards causing the lower 21, 22 and 23 once the insert 401 and conduit 403 are when these are coupled. As can be seen in Figures 18 tween the male and female portions of the connector the connector 400, forming a pneumatic connection beprotrusion from the surface of the body section 405. The 412 of the pivoting members increases nearer the top 408, 410, where the thickness of the upper arms 411. Figure 23, the body section has two pivoting members leave a bridging member. In cross-section as shown in defined by channels 409 cut from the body section to [0032] Additionally, at least one pivoting member 408

to be supplied to the conduit without externally running conduit. Again, this type of connection allows for power ing of the insert and conduit, pins 420 are inserted into the recess 419 in the electrical port 406. Each of the pins is soldered to the wires extending about or within the a connecting wire 421 and then the other end of this wire the conduit. For example, each pin can be soldered to is connected by appropriate means to the wires within [0033] Referring to Figure 22, before the over mould-

the connection end 423, forming a tapering end on the [0034] Reference is now made to Figures 20, 24, 25 the male portion 400 is coupled to the female portion tion 401 fit or clip into when the connection end 423 of which the small protrusions 415,416 on the female por-425, spanning the circumference of the portion 400, in portion 400. Partway along the portion 400 is a groove the diameter of the portion 400 decreases slightly, near shape, to allow gases to flow through the portion, invention. The male portion 400 is generally tubular in ternative form of a single port connector of the present 400 that couples with the female portion 401 of the aland 26, which illustrate various views of the male portion Ē

> õ usually retained within the humidifier control mechaof the elongate recesses is an electrical contact that is jection 426, forming an electrical connector, which housof the oval shaped rim 427 is a rectangular shaped proconnected via standard wiring 428 to the power supply, the male and female portions are coupled. At the base es elongate recesses that receive the pins 420, when to far into the female portion 401. Located on one part [0035] Located below the groove 425 is a rim 427, which prevents the male portion 400 from being pushed

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않 thus an electrical connection is formed between the conportion extends into the recess 419 in the electrical connector 406 on the female portion 401 and the pins 420 preventing removal of the male portion from the female conduit 403 and the humidifier by coupling the male and duit wiring and the humidifier. extend into the etongate recesses in the projection 426, portion. Simultaneously, the projection 426 on the male the small protrusions 415, 416 dip into the groove 425, tion fits within the tubular portion of the female body and connection is made as the tubular body of the male porfemale portions together. Once coupled a pneumatic the conduit 403, a connection is formed between the to the humidifier and the female portion 401 moulded to [0036] In use, once the male portion 400 is attached

protuberances 417, 418 formed in the outer covering 407 of the female portion thereby releasing the small the electrical connection between the two portions. from within the female portion, thereby disconnecting portion. The male portion can then simply be removed protrusions 415, 416 from the groove 425 on the male portion a user is simply required to apply pressure to the [0037] To remove the male portion from the female

ĸ outlet port of the chamber. grally with the chamber of the humidifier, forming the other forms the male portion 400 may be formed inteat the inlet end 424 of the mate portion 400. Although in appropriate means to the outlet of a humidifier chamber [0038] The male portion 400 is separately attached by

male and female portions from polypropylene, but other pass through the tubular pathway formed between the portion 602, where the male portion is finable within the a sliding collar 600, a female portion 601 and a male 36 a connector in this form is comprised of three parts, ing to the present invention as shown in Figures 29 to appropriate materials such as other thermoplastic maing collar is preferably moulded from acetyl, and the priate methods of manufacturing may be used. The slidjection moulded in a plastics material, but other appromale and female portions. Each of these portions is in-602, are generally tubular in shape to allow gases to collar 600, the female portion 601 and the male portion about the female portion 601. The three parts, the sliding female portion and the sliding collar slides over and [0039] A third form of a "single port" connector accord-

[0040] The sliding collar as depicted in Figures 29 and

terials may be used

gers. As shown in Figure 30, on the interior surface of the lower section 604, on the lower edge 607 at least trusions 608 slide within complimentary slots in the female portion 601 when the collar 600 is slid over the tion at its edge 605. Located on the exterior surface of one but preferably two spaced apart small protrusions 608 are integrally moulded in the collar 600. These pro-30 is of a generally tubular shape where the collar has the lower section 604 are depressions 606 that are the pressions 606 form a gripping surface for a user's fin-604. The lower section 604 is oval in cross-section and tapers inwards (in a reducing diameter fashion) to the upper section 603 that becomes circular in cross-secshape and size of a human finger pad so that the detwo sections an upper section 603 and lower section

pivoting member 612 is attached to the upper edge 616 portion 601. Located on the surface of the lower section 610 is a dimple for aperture 617 that receives a compliand about the female portion 601. Formed within the lower section 610 is a electrical port or recess 618 that houses pins as shown in Figure 35, which will be de-611. Integrally formed within the lower section are two prvoting members 612, 613, where the free end 614 pushed inwards past the external surface of the female mentary shaped protrusion located on the inner surface of the sliding collar 600 when the collar 600 is slid over of the sides of the lower section 610. The free ends 614 are moulded so that they protrude out of the surface of the lower section 610. The other pivoting end 615 of the of the lower section 610. The pivoting members 612, 613 are flexible and so allow the free ends 614 to be [0041] Referring now to Figures 31 and 32, which depicts the fermale portion 601 of the connector of the third form. The fermale portion 601 has upper and lower secforms a flexible member that is movable out of the plane tions 609, 610 and is of a corresponding shape, but signily smaller in diameter, to the sliding collar 600. Therefore, the upper section 609 reduces in diameter from the lower section 610 to an outer and upper edge scribed in more detail below. female portion 601.

type or frictional fitting.

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ly to electrical pins 621 residing within the recess 618 propylene or other appropriate plastics material over the tube 619 as shown in Figures 34 to 36. Referring to Figure 35 during or before the moulding of the female portion 601 over the tube 619, the wires (that reside within the breathing conduit bead 620 encircling the conduit 619), are connected to standard wiring and subsequent-The female portion 601 is moulded in a poly-[0042]

ods. The male portion is generally tubular in shape to allow gases to pass there through. It has a main body 622 that has a rim 623 located near to one end of the appropriate materials using other appropriate methterial by injection moulding, but may be formed from oth-Referring to Figure 33 that depicts the male portion 602 of the connector of the present invention. The male portion 602 is formed from a plastics type maformed during the moulding process.

body 622. The other end of the body 622 terminates in an o-ring 624 that causes the sealing between the male of the body 622 there is a elongate protrusion 625 of the shape and size of the recess 618 formed in the female portion 601 extending out and upward from the surface of the rim 623. Within the protrusion 625 are elongate Where the top of the rim 623 extends out from the side recesses 626 that receive the pins 621 when the male portion 602 and the female portion 601 when in use. portion 602 is inserted within the female portion 601. 5

[0044] Located partway along the body 622 of the male portion 602 are two horizontal recesses, of which only one is shown in Figure 33. The recesses 627 are shallow and located on the outer surface of the body 622, but do not extend through to the inner surface of the body 622.

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ering the female portion 601, whereas in Figures 35 and 36 show the sliding collar 600 covering all of the female collar at the depressions 606 and pull the collar upwards to remove it from the female portion 601. Other means such as twisting the collar about the female portion after the collar is slid onto the female portion, or a bayonet portion 601. To lock the sliding collar 600 about the female portion 601 the protrusion (not shown) on the inner surface of the collar 600 is received by the small protrufrom the female portion 601 the user need only grip the of locking the collar to the female portion are envisaged, 600 is slid over the conduit and about the female portion 601. Figure 34 shows the sliding collar only partially covsion 617 on the female portion. To remove the collar [0045] In use, once the female portion 601 has been moulded to the breathing conduit 619 the sliding collar 8 52 8

The inside edges of the pivoting members have lips 628 that extend inwardly. When the sliding collar 600 is passed down over the female portion 601 the pivoting members are pushed inwards and the lips 628 are pushed into the recesses 627 on the body 622 of the male portion 602. If an upward pulling force was placed upon the breathing conduit 619 the locking together of mate and female portions prevents the breathing conduit and female portion from being removed from the tion 602 is inserted within the female portion 601 and midifier. These wires 627 terminate within the protrusion 625 at contacts within the recesses 626 so that when pins 621 slide into the elongate recesses 626 and meet tween the humidifier and wires on the breathing conduit. [0047] In use, a pneumatic connection is caused bethe pivoting members slide along the body 622 of the male portion 602 and into the horizontal recesses 627. chamber of a humidifier by appropriate means, or if it is integrally moulded with the humidifier chamber, wires 627 extend from the male portion 602 to the humidifier heater base or other power source connected to the huthe female portion is coupled with the male portion the with the contacts forming an electrical connection between the male and female portion when the male por-[0046] When the male portion is connected to the ŧ, ŧ

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meets with the inner surface of the upper section 609 of male portion and chamber. Furthermore, the o-ring 624 the female portion creating a seal between the male and female portions.

## Cartridge Type Humidifier and Connector

20 9 portion of the connector 505 (attached to the end of a electrical connection to be made between the breathing preathing conduit 506) is connected to the male portions (both the pneumatic 501 and electrical 500 parts) the and electrical part 500 causing both a pneumatic and midifier 504 has a cartridge type chamber 502 that has the pneumatic connector part 501 of the male connector located on it. As shown in Figure 28 when the female female portion 505 fits over both the pneumatic part 501 as that shown in Figure 27, the electrical connector part 500 of a male connector, similar to that described above, is located on the base 503 of a humidifier 504. The hu-[0048] In other forms of the present invention, such conduit 506 and humidifier 504.

## Dual Port Electrical/Pneumatic Connector

35 30 (dry breathing conduit) extending from the vertilator or humidifier to the patient and carries humidified gases to [0049] During use of ventilator apparatus in a hospital, paratus used in hospitals are provided with a dry line blower that carries dry gas to the humidifier. A further breathing conduit, an inspiratory limb, extends from the the patient. A connector that can be used with such a where there is a humidifier and at least one breathing conduit, a connector of another preferred form of the present invention might be utilised. Some ventilator apsystem will now be described.

8 ş ŧ 16 and 17) to the humidifier. The male portion also has 301, 302, 303, 304. The first port 301 is connected to the conduit of the dry line, and the second port 302 is connected to the conduit of the inspiratory limb. The third 303 and fourth 304 tubular shaped ports are conlocated on it a rectangular shaped recess 306 that has er between the inspiratory limb and the humidifier. This from the humidifier to the wires residing in each of the dry line and inspiratory limb. The male portion 300 has four tubular shaped protrusions that each defines a port nected via a female portion 305 (as shown in Figures contacts within it that meet with the electrical wires runtridge connector provides two pneumatic connections, one between the dry line and the humidifier, and the othconnector also provides for an electrical connection [0050] The male portion 300 of a dual port caraidge connector is shown in Figures 14 and 15. The dual carning within or about the tubes.

each of the tubes and a humidifier the third 303 and shaped recesses 307, 308 in the female portion 305 and fourth 304 ports are inserted into complementary [0051] To provide a pneumatic connection between a latch (not shown) is inserted in a recess that causes

mechanisms within the humidifier, to provide power to protrusion 309 located on the female portion 305 is inserted into the electrical recess 306 of the male portion 300. The electrical protrusion 309 is connected to wiring within the humidifier and subsequently to the control the electrical wiring and to control the heating of the conduit, or to pick up signals sent through the wiring, similar grally formed with the electrical recess 306 of the male portion. Alternatively both the latch and recess may be priate locations. On insertion, a simultaneous electrical connection is made as the rectangular shaped electrical The latch may be formed integrally with the female portion, residing approximately where the electrical protruformed in the male and female portions at other approthe locking of the male and female portions together. sion 309 is tocated. Simitarly, the recess may be inte-5

[0052] The female portion 305 may form part of the priate means to the humidifier, similar to that of the single port form of the connector as described above in rechamber of the humidifier or may be attached by approto that as described above. lation to Figures 8 to 13.

[0053] The male 300 and female 305 portions are each injection moulded. In some cases the female portion 305 may be integrally injection moulded with the humidifier chamber. Each of these portions may be formed by other appropriate methods.

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more, the connector part, being made from a plastics type material is inexpensive to manufacture and will give hospitals and patients the option to dispose of the con-[0054] A dual port connector of this type allows for the connector to be easily dismantled and cleaned. Furthernector rather than to clean and disinfect the connector for reuse.

### Claims

 A connector to couple a gases supply means and a conduit, where said conduit includes electrical wire extending within, throughout or about said conduit. said connector comprising:

nected to one of said gases supply means and connector receiving means and an electrical said conduit, said male portion having a locking a male portion of a generally tubular shape con-

connected to one of said gases supply means a female portion of a generally tubular shape and said conduit, said female portion having a locking connector means and an electrical con connector receiving means, nector means,

gage with said locking connector receiving means and lock said male and female portions together. wherein coupling of said male and female portions causes said locking connector means to en-

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- A connector according to claim 1 wherein said gases supply means is a humidifier.
- A connector according to claim 1 wherein said gases supply means is an integrated blower and hu-35
- A connector according to claim 1 wherein said gases supply means is a positive pressure ventilation device.
- A connector according to any one of claims 1 to 4 wherein said locking connector means is a recess located on the external surface of said male portion. 8
- A connector according to any one of claims 1 to 5 wherein said locking connector means is a thread disposed upon the external surface of said male 25
- 7. A connector according to any one of claims 1 to 5 type fitting located on said male portion. wherein said locking connector means is a bayonet ಜ
- A connector according to any one of claims 1 to 7 surface and being connected to a power supply. nal surface of said male portion, said electrical socket having at least one first electrical contact wherein an electrical socket is located on the exterĸ
- A connector according to any one of claims 1 to 8 wherein said locking connector receiving means is a protrusion shaped to engage with said recess to cause the locking of said male and female portions â

A connector according to any one of claims 1 to 8

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- 11. A connector according to any one of claims 1 to 10 wherein said locking connector receiving means is a thread disposed upon the internal surface of said tubular shaped female portion. wherein said electrical connector receiving means
- is a recess having at least one second electrical socket and said pins, such that electrical contact is contact surface shaped to receive said electrical made between said first and second electrical con-ន

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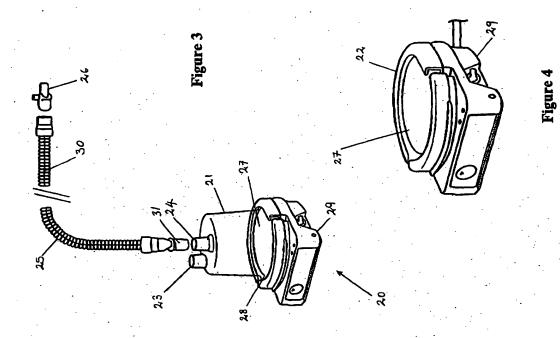
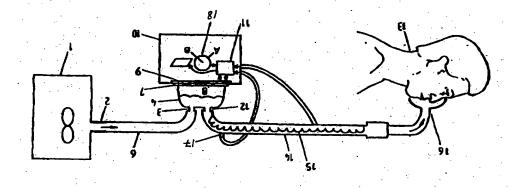
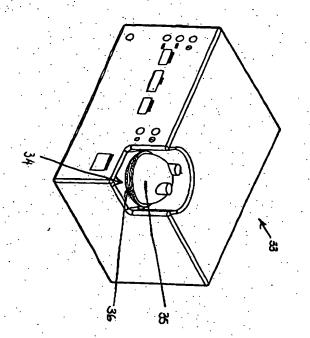


Figure 2



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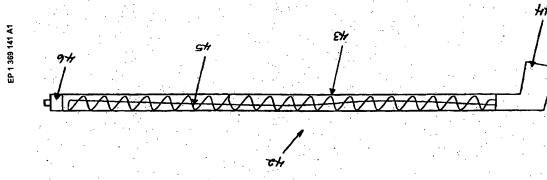
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**Figure 7** 



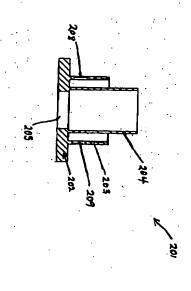
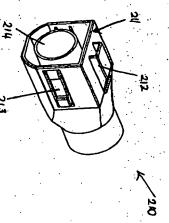


Figure 10



igure 11

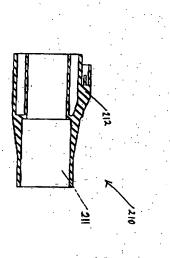


Figure 13

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Figure 17

Figure 14

Figure 1

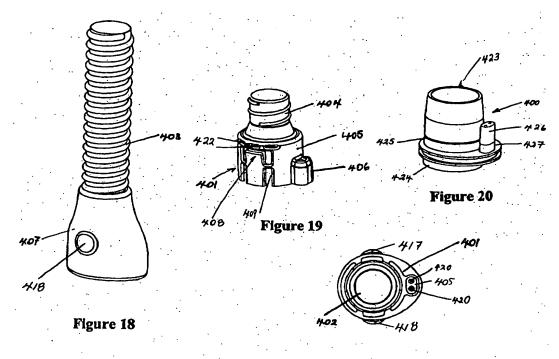


Figure 21

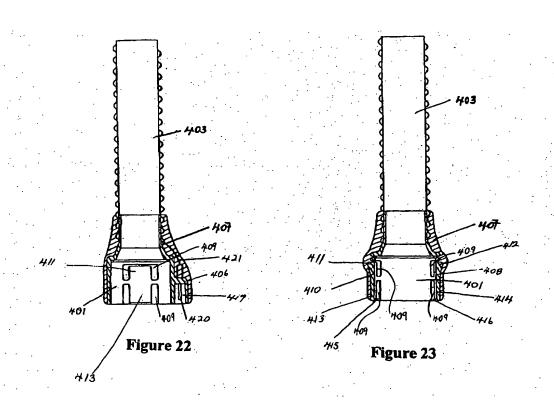
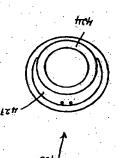


Figure 26



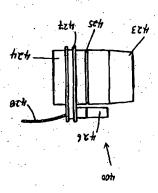


Figure 25

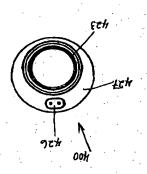


Figure 24

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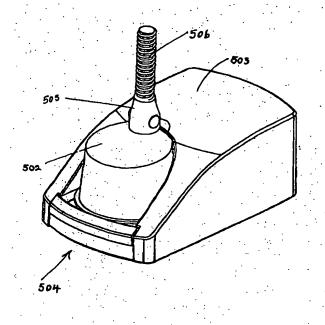
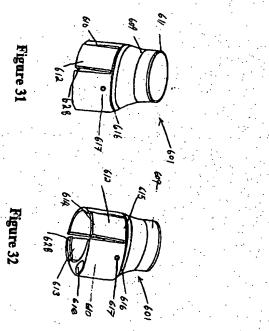
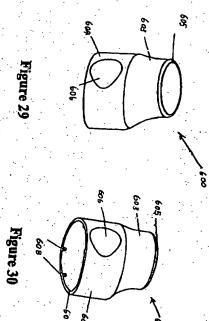


Figure 28





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